REMARKS

Reconsideration and allowance of this application are respectfully requested in light of the above amendments and the following remarks.

Claims 21, 22, 27, 29, 30 and 35 have been amended. Bases for the amendments to the claims can be found throughout the specification. Specific reference is made, for example, to the corresponding application as published at paragraphs 0116, 0109, 0002, 0128, 0173, 0204, 0206 and 0106.

At the outset, Applicants would like to thank Examiner Akram for the courtesy extended to Applicants' representative, Richard Jordan, at the telephonic interview of September 7, 2011. Applicants' representative finds the Substance of the Interview Section of the September 16, 2011 Applicant-Initiated Interview Summary to accurately describe the substance of the interview.

Claims 21, 22, 29, and 30 were rejected in the June 22, 2011 Office Action under 35 USC § 102(e) as being anticipated by Maenishi (US 2005/0129997). Claims 21, 22, 26, 27, 29, 30, 34, and 35 were also rejected under 35 USC § 102(b) as being anticipated by Taguchi (US 2003/0175562). Claims 21-23 and 29-31 were also rejected under 35 USC § 102(b) as being anticipated by Ukai (US 2001/0002248). Claims 25, 28, 33, and 36 were also rejected under 35 USC §103(a) as being unpatentable over Ukai as applied to claims 21 and 29, respectively. To the extent that these rejections may be deemed applicable to the amended claims presented herein, Applicants respectfully traverse as follows.

Applicants' invention as described in independent claim 21 is directed to a method of operating a hydrogen generator. Another aspect of the invention in this application is set forth in

independent claim 29, which is to a method of operating a fuel cell system that includes a hydrogen generator. In both aspects, the methods include heating a reformer by a heater; causing a steam reforming reaction to proceed to generate a reformed gas by the reformer; causing a shift reaction of the carbon monoxide in the reformed gas to proceed by a shift converter; and counting the number of times of start-up and/or stop of the hydrogen generator, in with the hydrogen generator including the reformer, shift converter, and heater. As the steam reforming reaction proceeds, the shift reaction is controlled based on the counted number of times of start-up and/or stop of said hydrogen generator, which includes the reformer, shift converter and heater. If the counted number of times of start-up and/or stop of said hydrogen generator is less than a predetermined number of times, the shift reaction proceeds at a first controlled temperature. If the counted number of times of start-up and/or stop of said hydrogen generator is not less than a predetermined number of times, the shift reaction proceeds at a second controlled temperature higher than the first controlled temperature.

The beneficial effects of carrying out the steps of the independent claims are demonstrated in the performance testing as described in paragraphs 0125 et seq., and shown in Fig. 2, of Applicants' corresponding published application. As indicated in paragraph 0128, if the reaction temperature of the shift reactor is increased at an appropriate, predetermined interval of start-ups and/or stops of the hydrogen generator, the amount of CO produced during the reforming step can be reduced by the shift reactor. This makes it possible to maintain an ability to supply a reformed gas containing less CO for a relatively long period of time, regardless of reformer catalyst degradation.

Maenishi discloses a hydrogen generator that comprises a controller configured to control supply of a material from a material supply portion and supply of water from a water supply portion. In general, the controller monitors water evaporator temperature and reforming catalyst temperature. Based on this monitored temperature, the controller controls water supply from the water supply portion to the water evaporator.

Maenishi differs from the methods of independent claims 21 and 29 in that Maenishi does not control the temperature of the shift reaction based on the number of times of starting up and/or stopping the reformer, shift converter and heater. In particular, Maenishi makes no disclosure or suggestion of carrying out the shift reaction at a first controlled temperature, if the counted number of times of starting up and/or stopping the reformer, shift converter and heater are less than a predetermined number of times, and carrying out the shift reaction at a second controlled temperature higher than the first controlled temperature, if the counted number of times of starting up and/or stopping the reformer, shift converter and heater are not less than a predetermined number of times.

According to Maenishi's embodiment described at paragraph 0104, the number of times in which the combustor is stopped and started, as well as the duration of time, are automatically preset according to the reforming catalyst at start-up. Based on the preset numbers, stopping and start-up of combustion is carried out.

Operation of the Maenishi hydrogen generator is more particularly detailed in paragraph 0058. According to that operation procedure, the reformer 3 is heated to a temperature at which the water evaporator 4 generates steam (i.e., start-up). The reformer 3 is heated such that the reforming catalyst reaches reaction temperature, while water is supplied to water evaporator 4

(i.e., preheat), and hydrogen is generated in the reforming reaction through contact of gaseous components with the reforming catalyst (i.e., hydrogen generation).

Fig. 5 of Maenishi shows that the combustor is repeatedly stopped and re-started at start-up of the hydrogen generator. Thus, it is only the combustor itself that is repetitively stopped and started-up, not the reformer, shift converter and heater of hydrogen generator. Therefore, Maenishi does not disclose counting the number of times in which the hydrogen generator is stopped and started-up.

Maenishi also indicates in paragraph 0104 that the number of times and the duration of times concerning stopping and start-up of combustion are set so that the water evaporator 4 is increased at an accelerating rate, while holding reforming catalyst temperature at less than 500°C. This means that temperature is changed based on the number of times in which the combustor is stopped and started-up. As indicated in paragraph 0058 and Fig. 5, the period in which the combustor is stopped and re-started is repeated only at start-up of the hydrogen generator. Hydrogen gas, however, can only be generated after start-up of the hydrogen generator.

Reformer temperature control in Maenishi is increased according to the number of times in which the combustor 12 is stopped and re-started. However, no reformed gas is generated during this period. Thus, Maenishi does not disclose increasing the reformed gas temperature in the shift converter. Accordingly, Maenishi fails to disclose controlling the temperature of the shift reaction based on the number of times of starting up and/or stopping the reformer, shift converter and heater, such that the shift reaction is carried out at a first controlled temperature, if the counted number of times of starting up and/or stopping the reformer, shift converter and

heater are less than a predetermined number of times, and at a second controlled temperature higher than the first controlled temperature, if the counted number of times of starting up and/or stopping the reformer, shift converter and heater are not less than a predetermined number of times. As a result, Maenishi fails to disclose or suggest the invention set forth in independent claims 21 and 29.

Taguchi is directed to a hydrogen purification apparatus. The apparatus comprises a shift gas catalyst that contains a metal oxide of at least one element selected from Fe, Cr, Ce, Mo, W, Re and Cu, and at least one precious metal of Pt, Pd, Rh and Ru. At paragraph 0132, Taguchi provides a specific example involving stopping and starting the apparatus in which CO concentration was measured. The apparatus was stopped and restarted, with the operation being repeated 10 times. Such an operation, however, fails to suggest controlling the temperature of the shift reaction based on the number of times of starting up and/or stopping the reformer, shift converter and heater, such that the shift reaction is carried out at a first controlled temperature, if the counted number of times of starting up and/or stopping the reformer, shift converter and heater are less than a predetermined number of times, and at a second controlled temperature higher than the first controlled temperature, if the counted number of times of starting up and/or stopping the reformer, shift converter and heater are not less than a predetermined number of times. Accordingly, Taguchi fails to disclose or suggest the invention set forth in independent claims 21 and 29.

Ukai discloses a hydrogen generator that is able to maintain a supply of reformed gas at low CO, while shift gas catalyst becomes deactivated. At paragraph 139 of Ukai, it is disclosed that the composition of the reformed gas at outlet 8 is measured, and the stop/start cycle repeated

200 times. At paragraph 0018, it is further disclosed that when the amount of reformed gas supplied to the shift reactor is increased, when the temperature of the downstream portion of the shift catalyst is increased before any temperature increase of the reformed gas and when the amount of reformed gas sent to the shift reactor is decreased, the temperature of the downstream portion of the shift catalyst is lowered to a temperature lower than that prior to any decrease in the flow of the reformed gas. These cited paragraphs mean that Ukai discloses changing downstream temperature of the shift catalyst according to a change in reformed gas flow rate to the shift converter. There is no suggestion in Ukai of controlling the temperature of the shift reaction based on the number of times of starting up and/or stopping the reformer, shift converter and heater, such that the shift reaction is carried out at a first controlled temperature, if the counted number of times of starting up and/or stopping the reformer, shift converter and heater are less than a predetermined number of times, and at a second controlled temperature higher than the first controlled temperature, if the counted number of times of starting up and/or stopping the reformer, shift converter and heater are not less than a predetermined number of times. Accordingly, Ukai fails to disclose or suggest the invention as described in either of claims 21 or 29.

Accordingly, it is submitted that all pending claims are directed to allowable subject matter, and a notice of allowance is respectfully requested.

Respectfully submitted,

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